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ABSTRACT

Although the relationship between reading and writing proficiency has interested scholars for two centuries, the exact nature of this relationship has resisted discovery. The persistance of statistically significant correlations across a broad range of subjects, measures, and experimental settings leaves no doubt that a moderate link between reading and writing exists. However, experiments that have used reading treatments to improve writing performance and vice versa have generally been unsuccessful. The most promising treatments are those that teach prose structure and story schemata and the least successful are those that teach general reading and writing skills and expect automatic transfer to the other. There is also some evidence that the complexity of prose in basal readers and the method of teaching beginning reading influence students' writing ability. Recent studies have begun to explore the processes used by readers and writers. The major shortcoming of most reading/writing research is that it has been atheoretical and has tinkered with methods rather than tested theoretical models. (Twenty-four pages of references are included.) (Author/JD)

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READING ACHIEVEMENT AND WRITING PROFICIENCY:

A CRITICAL REVIEW OF RESEARCH

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ABSTRACT

Although the relationship between reading achievement and writing proficiency has interested scholars for over two centuries, the exact nature of this relationship has resisted discovery. The persistence of statistically significant correlations across a broad range of subjects, measures, and experimental settings leaves no doubt that a moderate link between reading and writing exists. However, experiments which have used reading treatments to improve writing performance and vice versa have generally been unsuccessful. The most promising treatments are those which teach prose structure and story schemata and the least successful those which teach general reading or writing skills and expect automatic transfer to the other. There is also some evidence that the complexity of prose in basal readers and the method of teaching beginning reading influence students' writing ability. Recent studies have begun to explore the processes used by readers and writers. The major shortcoming of most reading-writing research is that it has been atheoretical and has tinkered with methods rather than tested theoretical models.

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READING ACHIEVEMENT AND WRITING PROFICIENCY:

A CRITICAL REVIEW

Theoretical and practical interest in the relationships between reading skill and writing ability can be traced at least as far back as the Sophists of Ancient Greece who felt that

> ...the use of literary sources guaranteed an emotionally rich and evocative flow of language ...a flexible command of the literature formed a comon background of ideas, images, and feelings (Broudy and Palmer, 1965, p. 10).

However, beyond the obvious assertion that wide reading provides models for the structure of sentences and paragraphs, aids in vocabulary development, and suggests appropriate topics and content for the writer, the exact nature of the reading-writing connection has been difficult to pin down.

Historically, reading and writing have often been viewed as opposite ends of a language continuum: one is receptive while the other is productive; one encodes while the other

decodes; one presents words, structures, ideas, and attitudes in the form of a text while the other uses words, structures, ideas and attitudes as building blocks to create a text. Consequently, research and theory in reading-writing relationships tended to treat reading and writing as separate, related skills and endeavoured to discover the degree to which good readers were also skilled writers (correlational studies), how one skill enhanced the other (the role of wide reading and models in learning to write), and how improving one skill affected performance in the other (teaching reading and measuring the effect on writing and vice versa). This view of reading and writing emphasizes similarities and differences in the *products* of the two skills and attempts to find cause and effect relationships describing how one influences the other. Recent work, on the other hand, has emphasized the relaltionship between the two *processes* noting that both readers and writers construct meaning through a transaction with the printed word (Squire, 1984; Tierney and Pearson, 1984), that both reading and writing provide intrusions in and guides for the individual's stream of meditation (Moffett, 1984), and that since the myriad of skills and knowledge required by a writer could not possibly be taught directly, the writer must induce these skills from the printed page by "reading like a writer" (Smith, 1984). Currently, however, work on relating the two processes is almost entirely in the early stages of exploration and little empirical research is available.

The following paper summarizes theory and research on the relationships between reading and writing, examining first the various theoretical orientations which postulate reading-writing connections and then the major research findings both correlational and empirical which define the relationships. The paper concludes with a critical discussion of the shortcomings of previous reading-writing research and notes a number of conceptual problems which future researchers need to take into consideration.

I. Theoretical Orientations

Research on reading-writing connections has, of course, been shaped by the investigators' perceptions of the interrelationships among the language arts and their assumptions of the underlying similarities and differences among speaking, listening, reading, and writing. As Emig (1983) notes, talking and writing are often characterized as active, productive, or encoding processes while reading and listening are said to be passive, receptive, or decoding processes. Alternatively, listening and speaking may be considered first-order symbolic systems while writing and reading are second-order. Such paradigms naturally lead to research which compares and contrasts the features of each of these forms of communication.

Received wisdom on the relationship between the two generally falls into one of two broad, non-exclusive

categories: the first is that style, usage, and background knowledge are absorbed through reading so that over a long period of time the wide reader will induce book talk from exposure to the printed page; the second is that reading and writing are both aspects of linguistic competence and anything which alters one (e.g., an improvement in receiving the printed word) will have an automatic if perhaps delayed effect on the other.

The assertion that wide reading and imitation improve writing has been passed down from classical rhetoricians and finds its way into much textbook advice on becoming a writer. Typical is Perrin and Ebbitt's (1972) claim that

> Reading is probably the most valuable formative influence on a writer. Sometimes the influence is direct, as when there is a conscious, deliberate imitation of an admired author. More often, it is indirect, casual, cumulative. Just as we unconsciously pick up expressions and modes of expression from those we talk to, so we absorb rhythms, turns of phrase, and syntactic patterns from our reading....If you read a good deal, you are likely to be more comfortable writing yourself; you will write more easily and confidently. And you will be a better judge of what you write (p. 28).

Such reading may be either silent or oral. Gay (1977), for example, suggests that reading aloud to students will enhance

their writing by increasing vocabulary, improving ability to distinguish between subtle shades of meaning, improving the sophistication and complexity of sentence structure, providing a sense of structure and organization, and providing a motive for writing.

Frank Smith (1984) has added a new dimension to this position by suggesting it is not simply wide reading but the method of approaching print which developes writers. Based on his observation that "writing requires an enormous fund of specialized knowledge which cannot be acquired from lectures, textbooks, dirll, trial and error, or even from the exercise of writing itself," he conjectured that the intangibles of writing could be learned only through reading (p. 47). However, Smith noted that the paradox he faced with this assumption was his own argument that fluent readers need not pay attention to matters such as spelling and punctuation. Consequently, he concluded that to learn to write, children must read in a special way: they must "read like writers." Such reading, he argues, is not the result of deliberate study but reading which is vicarious, concurrent, and induced at the first encounter; it is effective only if readers feel capable of producing texts similar to those that they are reading.

Evidence for the influence of wide reading and literature study on written composition has been provided by correlational studies (e.g., Glazer, 1973; McConnell, 1983),

by observational studies (Burton, 1985), by studies of writers' environments (Weathermon, 1984), and by accident (wide reading was the control treatment in Heys' (1961) study of the theme-a-week assumption). In addition, researchers have gathered some evidence (e.g., Church and Bereiter, 1984) which supports Smith's "reading like a writer" suggestions.

The linguistic-competence orientation, on the other hand, tends to focus on direct teaching of discrete skills and characterizes readers and writers as being either proficient or deficient in these skills. As Artley (1948) suggested:

> Figuratively stated, speaking and reading comprise two sides of a square known as communication or language, the other two sides being writing and listening. Being inextricably associated, any limitation or facility in one is reflected to some degree in the others (p. 351).

With the execption of correlational studies, most of the research into reading-writing relationships has its foundations in a skills orientation. Such research includes studies of beginning reading (Eckhoff, 1985; Smith, 1968), sentence combining (Straw and Schreiner, 1982; Mackie, 1982), computer writing programs (Lott, 1985; Thompson, 1985) and creative or expressive writing programs (Collins, 1979; De la Rosa, 1979), and prose structure and organization (Taylor and Beach, 1984; Bossone and Troyka, 1976; Crowhurst, in press).

Recently, transactional theories of literature (e.g., Rosenblatt, 1976) and heuristic theories of composition (e.g., Murray, 1978) have been combined to focus on both readers and writers as creators of meaning through print. These theories postulate fundamental cognitive similarities in the two processes and promote research which investigates the ways in which reading and writing shape thinking. As Jensen (1984) notes,

> During the last decade, research and theory from a variety of language-related disciplines have contributed to a view of the composing and comprehending processes as that of actively constructing meaning in accord with one's prior cognitive, linguistic, and affective experience. Writers and readers share a common goal: they must construct a coherent text (p. 2).

Describing this text construction metaphorically, Tierney and Pearson (1984) suggest that "texts are written and read in a tug of war between authors and readers" (p. 34).

Squire (1984), Moffett (1984), and Petrosky (1982) offer three different perspectives on the transactions among readers, writers, and texts. Squire emphasizes cognitive processing:

> Composing is critical to thought processes because it is a process which actively engages the learner in constructing meaning, in developing ideas, in

> relating ideas, in expressing ideas. Comprehending is critical because it requires the learner to reconstruct the structure and meaning of ideas expressed by another writer. To possess an idea that one is reading about requires competence in regenerating the idea, competence in learning how to write the ideas of another. Thus both comprehending and composing seem basic reflectons of the same cognitive process. This is what the teaching of the higher thought processes is all about (p. 24).

Moffett places the reader and writer in an even more central position with respect to the text, describing reading and writing as forms of meditation, ways of modifying inner speech. He notes that reading, writing, and meditation

> modify the inner stream during the act itself, produce at their most intense an altered state of consciousness and over the long haul liberate the patterns of perception and thought in the direction of expanded or higher consciousness. Reading assimilates one person's composed inner speech into another person's on-going inner stream so that one's composition temporarily restructures the other's consciousness. Writing temporarily restructures one's own consciousness as one focuses, edits, and revises the inner stream so as

to act on another's.

Petrosky connects reading and writing as processes of composing which are central to human understanding:

> one of the most interesting results of connecting reading, literary, and composition theory and pedagogy is that they yield similar explanations of human understanding as a process rooted in the individual's knowledge and feelings and characterized by the fundamental act of making meaning, whether it be through reading, responding or writing. When we read, we comprehend by putting together impressions of the text with our personal, cultural, and contextual models of reality. When we write, we compose by making meaning from available information, our personal knowledge, and the cultural and contextual frames we happen to find ourselves in.

Pearson and Tierney (1985) note that schema-theoretic accounts of reading regard comprehension as an act of constructing meaning and add that they are "struck by the similarity of language used to describe composing and comprehending." They propose a composing model of reading, suggesting that the thoughtful reader is a planner, composer, editor, and monitor; however, they admit that in practice--especially the practice of secondary school students--the model is contrary to what they currently find.

Studies are just beginning to examine the similarities and differences in reading and writing processes and have yet to explore how readers and writers transact with print to construct meaning. (Birnbaum, 1981; Atwell, 1981; Ryan, 1984; Dahl, 1984; Kirby, 1986; Shepherd, 1986).

II. Correlations Between Reading and Writing

Moderate, statistically significant correlations between reading and writing abilities ranging as high as .90 but generally falling between .25 and .55 depending on the measures used and the age, experience, and sex of the subjects have been reported in a wide variety of studies. Significant correlations have been found between reading ability and each of the following: general writing ability, syntactic complexity, standard editorial usage, method of teaching beginning reading, and biographical factors. In addition, scores on written compositions have been found to be reliable predictors of reading ability. However, when subjects are ranked first by reading ability and then by writing ability, one in five is good in one skill but poor in the other.

a. *General Correlations*. Over the past 40 years, researchers have reported significant correlations between reading and writing ability using a wide variety of measures of each and examining age and grade levels kindergarten

through adult. Based on work with Scholastic Aptitude Tests, Diederich (1957) concluded that good measures of reading ability were the most trustworthy indicators of writing ability. The most detailed correlational evidence is provided by Loban's (1963, 1966, 1967, 1976) thirteen-year study which followed students from kindergarten through grade twelve. Commenting on the reading and writing abilities of grade-six students (1963) he noted that "...on every statistical measure one fact is extremely clear in the present study: those who read well also write well; those who read poorly also write poorly" (p. 75). Reporting on the same students when they reached grade nine he stated that "Relationships between reading and writing become more pronounced as the years pass" (1966, p. 82). Leone (1979) studying kindergarten students; Bippus (1977) and Ledford (1984) examining intermediate students; Stilley (1981) and Hartman (1984) working with high school students; and Thomas (1976) and Calhoun (1971) studying college students reported statistically significant correlations ranging from .18 to .55 between reading and writing measures. In a meta-analysis of 89 studies which correlated reading, writing, speaking, and listening measures conducted between 1950 and 1978, Hammill and McNutt (1980) reported that the median correlation between 37 measures of reading and writing was .61. The median correlation between 31 reading and spelling measures was somewhat stronger at .68, but those for ten reading and mechanics measures were weaker at .52.

Another perspective on correlations is offered by Shanahan (1984) who correlated four measures of reading and three of writing and reported that in the best case, a measure of one set accounted for 43 percent of the variance in the opposite set.

Related evidence is provided by studies predicting reading ability from writing measures and vice versa. Working with over 300 students from junior and senior high school and college, Lazdowski (1976) reported that the reading level of a student could be predicted within one grade level with a reliability of .88 from the students' grade on a written composition. On the college level, D. Campbell (1976) reported that scores on reading tests were reliable predictors of writing skill. Wade (1982) investigated the relationship between children's oral and written language and their reading comprehension scores and concluded that the number of words per written clause is the best single predictor of reading comprehension. D'Angelo (1977), working with grade-nine students, reported that reading and writing ability correlated beyond the .01 level of confidence, but that listening comprehension and listening memory were more effective predictors of reading ability than informative writing was.

The sex of the subject has also been shown to be related to correlations between reading and writing. Fishco (1966) and Belanger (1978) reported that correlations between

reading and writing quality measures were much stronger for girls than they were for boys, but Johnson (1980) and Belanger noted stronger correlations for boys than for girls when syntactic complexity was measured. Fishco, examining 95 seventh-grade students, found that reading comprehension and creative writing ability correlated beyond the .05 level of confidence. However, the correlations for the girls in the study were beyond the .01 level of confidence while the correlations for the boys were statistically nonsignificant. Belanger, working with 194 students in grades nine and ten, reported correlations between three forms of a standardized reading test and the overall quality of three expository compositions written at three month intervals to be significant beyond the .001 level of confidence. However, the correlations for the girls in the study were .57, .70, and .59 while those for the boys were only .35, .33, and .37. On the other hand, reading and T-unit measures correlated slightly higher for boys (.12, .12, and .15) than for girls (-.01, .04, and .04) although all were statistically nonsignificant. Johnson also reported that reading and T-unit measures correlated significantly for boys (p=.05) but not for girls.

Shanahan (1984), Barnes (1983), and Johnson (1980) have reported some grade-level differences in the reading and writing relaltionship. Reporting a study of over 500 students in grades two and five, a study which used four standardized

measures of reading and three measures of written composition, Shanahan described the relationship at the grade-two level as one of general reading or word recognition and word production (spelling). He reported that the reading-writing relationship appeared to be relatively stable across the two grade levels, the only difference lying in the increasing importance of reading vocabulary. Barnes gathered argumentative, expository, and descriptive writing samples form third-, fifth-, and seventh-grade students. He compared reading achievement tests with the readability of the written compositions (a composite score based on five readability formulae) and concluded that the students' grade levels in writing readability did not increase with their grade levels in reading. The writing scores of the grade-three students were one year behind their reading level, but the scores of the grade-five and -seven students had fallen three and five years behind respectively. Johnson noted a number of significant correlations between scores on a standardized reading test and clause and sentence length factors on the grade-three level, but only one significant correlation in any of grades four, five, or six (she reported that words per clause and reading correlated significantly only at the grade five level).

b. *Reading and the Syntactic Complexity of Writing*. The majority of studies examining the relationship between the syntactic complexity of students' written compositions and

reading ability have reported significant correlations between the two.[1] These correlations have been reported at all grade levels, grade one through university, and on the basis of a variety of reading and writing measures. In one of the most detailed studies, Evanechko et al. (1974) correlated eight reading subtests with 13 measures of syntactic maturity on the grade six level. They found that 76 percent of the correlations were significant at or beyond the .05 level of confidence with Loban's Communication Unit (analagous to Hunt's T-unit) significant beyond the .00001 level of confidence. Significant correlations between written T-unit length and reading ability have been reported at the elementary level (Heil, 1976, grades 1 to 3; Harris, 1975, grade 2; Zeman, 1969, grade 2; Johnson, 1976, grades 3 to 5; Anguili, 1985, grades 3 to 5); at the secondary level (Bushner, 1980, grades 7 and 8; Hartman, 1984, grade 9); and at the college level (Heller, 1980).

Kuntz (1975), Heller (1980), and Bushner (1980) examined the elements of syntactic complexity which correlated most highly with reading ability. Kuntz examined the correlations between reading ability and the ability to make sentence transformations on the grade-seven level. She reported that correlations ranged from .68 to .90 and noted that the more difficult transformations correlated the most highly with

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[1] Correlational studies are discussed here. Studies of the influence of sentence-combining treatments on reading ability are reported below in Section c. of Intervention Studies.

reading ability whereas the least difficult transformations correlated the least highly. In an investigation of university freshmen's reading comprehension and syntactic elements in their expository writing, Heller concluded that whereas poor readers wrote shorter T-units that were usually expanded by adding subordinate clauses, good readers wrote longer T-units which they expanded through such non-clausal structures as prepositional phrases. Bushner, in an examination of 120 students in grades seven and eight, reported statistically significant differences among very good, average, and poor readers in number of words written, number of words per T-unit, and number of words per clause. These measures of productivity and syntactic complexity correlated with total reading, literal reading, and inferential reading scores. Simon (1980) found significant relationships between words per T-unit in tenth-grade students' written work and their patterns of response to literature as measured by a Response Preference Test (based on the Purves and Rippere categories), but reported no significant differences between the two groups on the amount of transfer from reading to non-reading experiences.

However, conclusions on the relationships between syntactic complexity and reading ability are not unanimous and studies by Thomas (1976), Fuller (1974), Stewart (1978), Belanger (1978), Magee (1978), and Zeman (1969) have called into question the strength of the relationship between the

two. Thomas found a small (r=.18) but statistically significant (p=.05) correlation between the reading achievement and syntactic complexity scores of college freshmen and concluded that "The student's ability to read is only negligibly related to his ability to write." Fuller examined good and poor readers on the junior college level and reported no differences in the lengths of their written T-units. Stewart found that T-unit length of written compositions did not contribute to the prediction of reading comprehension of fourth-grade students and Belanger, studying students in grades nine and ten, found very low correlations (.06, .08, and .09) between scores on a standardized reading test and the length of T-units in expository compositions despite moderate (.47, .54, and .48) and statistically significant (p=.0001) between reading scores and evaluations of the overall quality of the compositions. In a study of fifty bilingual college frehsmen, Magee reported that T-unit length in written compositions correlated with scores on a relatively simple standardized reading test but not with those on a more difficult standardized test. Zeman reported that reading test scores of grade-two and -three students correlated significantly (p=.01) with the number of compound sentences in their written work but that there were no significant correlations between reading scores and use of Roberts' sentence patterns.

Reading ability as measured by a cloze test has been shown to correlate either nonsignificantly (Siedow, 1973) or inversely (Evans, 1979) with measures of syntactic complexity. Examining students in grades four, eight, and twelve, Siedow reported positive but statistically nonsignificant correlations between scores on a cloze test and the syntactic complexity of students' written compositions. Evans constructed a cloze test from nine published prose passages which were rewritten to reflect three levels of syntactic complexity. He found an inverse correlation between scores on this and the syntactic complexity (nominalizations, subordination, and T-unit length) of a short exercise on combining kernal sentences. Evans reported significant increases in syntactic complexity from grade to grade (eight, twelve, and the final year of university) but an overall decline in cloze scores.

c. *Standard Usage and Spelling*. M. Campbell (1976), Ledford (1984), Hill (1982), and Pitts (1984) reported significant correlations between reading ability and absence of errors in standard written usage and spelling. Comparing performance of university freshmen on a standardized reading test and an in-class composition, M. Campbell reported that correctness in organization and mechanics was more highly related to superior reading skill than fluency of ideas was. Ledford, examining fifth-grade students' stories, found statistically significant correlations between reading

achievement and students' "use of mechanics, adjectives, adverbs, comparative references, other conjunctions, lexical cohesion, and total number of words." Hill reported similar findings studying students in grades seven and eight. Pitts examined the relationship between reading scores and spelling errors of 71 underprepared college freshmen and reported that capable readers made significantly fewer orthograhic errors than adequate or disabled readers made and significantly fewer phonological errors than disabled readers made.

d. *Environmental Factors*. The subjects' reading histories and school and home environments have also been shown to be related to writing ability. McConnell (1983) and Weathermon (1984) reported that writing achievement was related to reading experience while Donelson (1967), Monk (1958), Woodward and Phillips (1967), Felland (1981), and Lacampagne (1968) demonstrated that writing ability correlates with such factors as the number of books owned by students, the number of books and magazines found in the home, the number of books read by the parents, and the amount of television watched.

McConnell (1983) categorized 144 second-grade children into four groups based on their exposure to literature and their writing practice. She reported that the group of students who had high literature exposure and frequent writing practice received significantly higher holistic ratings on narrative writing samples, but that there were no

significant differences on meausres of vocabulary or story structure elements among the four groups. Case studies of two of the children led McConnell to conclude that "sex, intellectual ability, reading ability, television viewing hours, and motivation need to be considered in future studies examining factors which influence writing ability."

Using questionnaires and interviews to investigate the influence of home factors on 160 grade six and seven students judged to be more effective writers and less effective writers, Weathermon (1984) concluded that a conducive atmosphere for an aspiring writer included a home in which reading and writing activities take place regularly and are often discussed; in which parents and siblings model language skills and have positive attitudes towards the acquisition of these skills; in which reading and writing materials are readily available; and in which a portion of the subject's leisure time is devoted to quiet, indoor, creative activities excluding large amounts of television viewing. He also noted that the parents of more effective writers read aloud to their children *after* they had learned to read for themselves significantly more often ($p=.05$) than did the parents of less effective writers, but that there were no significant differences between the two groups in the time spent reading aloud to their children *before* they could read for themselves.

On the college level, Woodward and Phillips (1967) found that the poor freshman writer (one who received a "D" or an "E" in the first semester writing course) had a lack of interest in reading and writing, a lack of reading material in the home, and a sparsity of writing and reading experiences in high school when compared with good freshman writers. Monk (1958) found that superior grade-seven writers were likely to be "children whose leisure-time reading was intensive, whose parents also did considerable reading, and whose homes were well supplied with books. Donelson (1967) reported that the amount of reading done by the father (but not the mother) was one factor which distinguished between good and poor grade-ten writers. Lacampagne (1968) and Felland (1980) conducted national surveys of superior and average writers (Lacampagne's superior writers were NCTE Writing Achievement Award winners), but neither reported significant reading differences between the two groups. Lacampagne found "some" correlation between extensive reading experiences and superior writing ability and Felland noted that superior writers read more books than average writers. Both studies suffered from a lack of a clear definition of the average writer, however, which might have confounded the results.

e. *Writing Skill and the Teaching of Beginning Reading.* During the 1960's and early 1970's when the great debate on learning to read was raging, researchers examined the

relationship between writing skill and the method of teaching beginning reading with the majority of the studies, predictably, comparing students trained by the Initial Teaching Alphabet (i.t.a.) and those taught by Traditional Orthography (T.O.). Researchers reported that when compared with their T.O.-trained counterparts, the i.t.a.-trained students had more advanced and diverse written vocabularies at the end of grade two (Downing, 1967; Carner, 1971; Trost, 1971); wrote significantly better compositions (Fyfe, 1965, grade-three students; Shapiro, 1973, grade-two students); and wrote sentences which more closely approximated their oral language capacity (Sandel, 1970, grade three; Magnuson, 1968, grade one). Nonsignificant differences favoring the i.t.a.-trained students were reported for T-unit length, sentence length, story length, use of conjunctions, mazes, and embeddings (Mazurkiewicz, 1973; Stewart, 1969; Ackerman, 1969; Folta, 1968).

Smith (1968) and Quinn (1977) noted significant writing gains for students taught by synthetic phonics programs and those trained by the the language experience approach. Smith, in a study conducted with grade-one students in five different geographical areas of the United States, concluded that students taught to read using synthetic phonics were superior in both reading and writing performance to students taught with a "meaning emphasis" (including "analytic phonics"). On both the word-meaning and paragraph-meaning

sections of the Stanford Achievement Tests in reading, students trained by synthetic phonics were superior to students trained by analytic phonics beyond the .001 level of confidence. The synthetic-phonics trained students were also superior (p=.001) on two composition rating scales: 1. clarity and completeness of communication, and 2. spelling, length, original ideas, and the use of rhetorical devices. Quinn compared the "basal" and "language-experience" approaches to teaching reading at the grade-one level. She found that compositions written by students trained by the language-experience approach were significantly (p=.01) better than those of the students trained by the basal approach on the following features: complete sentences, difficult words, and creativity. Although this debate has died out in recent years, it may well be rekindled by those investigating the whole-language approach since this method integrates the four language arts and emphasizes communication and substantive use of language.

f. *Ranking Students on Reading and Writing Performance.* Ranking students first on reading skill and then on writing skill provides a more visual although less precise method of protraying the relationships between the two skills than correlational data offer. Loban (1963), Belanger (1978) Martin (1977), and Tierney and Leys (1984) found that a group's ranking on one skill is frequently a poor indicator of its ranking on the other.

Loban reported that between 20 and 30 percent of the students who ranked high on one skill ranked low on the other. For example, 25 percent of the most proficient fourth-grade readers and 20 percent of the best sixth-grade readers were judged to be inferior or illiterate writers while 30 percent of the least proficient fourth-grade readers and 20 percent of the least able grade-six readers were judged to be good or superior writers. Tierney and Leys reported that twenty percent of the grade three students who ranked in the first quartile on reading or writing measures ranked much lower (at the bottom of the second or in the third quartile) on the other skill.

Belanger ranked four groups of students (experimental and control girls and boys) on a standardized reading test and four scores on an expository composition (overall quality, T-unit length, Syntactic Density Score, and composition length in number of words) on both the grade-nine and grade-ten levels. A group's ranking on one measure could be used to predict its ranking on the other on only nine of the 32 comparisons. On four of the 32 comparisons, the group ranking highest on one measure ranked lowest on the other. In some cases the differences in a group's scores on the two tests were substantial. For example, the grade-ten experimental girls and the grade-nine experimental boys scored a half standard deviation below the mean on the reading measure but a half standard deviation above the mean

on the writing quality measure. It seems unlikely that these rankings were an artifact of testing as both were maintained at two subsequent testings at three-month intervals.

Comparing the reading and writing skills of six Australian technical school students, Martin found that while one subject earned high scores on both tests and another subject earned low scores on both tests, four subjects scored well on one skill and poorly on the other. Martin concluded that much depended on "the individual's perception of the purpose or usefulness of the reading and writing and the extent of his motivation" (p. 52).

g. *Summary*

The most important feature of the correlational studies is the sheer weight of the data. The persistence of statistically significant correlations across a broad range of subjects, measures, and settings indicates that a moderate link exists between reading achievement and writing performance. These data support the common observation that able readers are usually skilled writers while those who have difficulty with one often face problems with the other. However, studies which ranked students first on one measure and then on the other suggest that about one-fifth of the subjects are good readers and poor writers or vice versa. Thus, a small proportion of the population may account for much of the less-than-perfect correlational data.

Understanding the correlations is hampered by two methodological problems. First, since correlational data have usually been obtained as a by-product of studies of other aspects of reading and writing (frequently studies which failed to prove their central hypotheses), the credibility of their conclusions is somewhat weakened. Second, since correlational studies have not been supported by adequate theoretical models of either the reading or the writing process, the underlying competencies represented by the correlations remain poorly understood.

III. Intervention and Observation Studies

Intervention studies into reading and writing connections fall into one of three categories: studies which teach reading skills and measure the effect on writing ability; studies which teach writing skills and measure the influence on reading ability; and studies which address general language competence (mainly sentence combining) and measure the outcome on both reading and writing ability. All three are product-centered in that they strive to measure improvements in subjects' reading and writing production rather than understand the process by which they produce reading or writing.

a. *The Influence of Reading Treatments and Reading Practice on Written Composition.* Although researchers have been probing a causitive reading-writing connection for over

a half century, to date not one study has demonstrated that a replicable reading treatment, method, or program has had a statistically significant impact on both reading and writing ability as judged by standard measures of reading and writing achievement. Indeed, the majority of studies attempting to teach reading and measure the influence on writing have failed to effect significant changes in reading ability. On the other hand, studies which have included considerable amounts of time for free reading (often as the control or placebo treatment in research testing writing methodologies) suggest that reading practice may have a positive influence on writing ability.

The majority of the reading treatments in studies examining the influence of reading improvement on writing skill have been some form of textual analysis with many earlier studies focussing on rhetorical devices and stylistic matters (Mathews, Butler, and Larsen, 1945; D. Campbell, 1976; Matt, 1977; Bossone and Troyka, 1976; Perry, 1980; Austin, 1983) and more recent studies examining the teaching of schemata and text structures (Taylor and Beach, 1984; Crowhurst, in press; Braun and Gordon, 1982; Williams, 1986; Bereiter and Scardamalia, 1984). Other studies have examined the effects of vocabulary and paragraph reading instruction (Eurich, 1931), reading skills (Schneider, 1971; Miller, 1974; Hart, 1980), a comparison of traditional and psycholinguistic methods of teaching remedial reading

(O'Donnell, 1974), and a phonics-based remedial treatment (Belanger, 1978).

Treatments which examined rhetorical devices and stylistic matters generally either used unconventional measures of reading (Matt, 1977; Austin, 1983) or inadequate measures of writing (Mathews, Butler, and Larsen, 1945; Hart, 1980). In addition, a number of studies used experimental and control treatments which appeared to be very similar. D. Campbell (1976), for example, taught an integrated reading and writing course which concentrated on analysis of rhetorical devices to experimental students in two sections of freshman composition while their control counterparts studied only written composition. Following the twelve-week experiment, slight and statistically nonsignificant gains on a reading measure favored the experimental groups while nonsignificant gains on a writing measure favored the control groups.

The Bossone and Troyka (1976) study of remedial English--the most careful and promising of the rhetorical studies--is difficult to interpret because of mixed results on two reading measures. Bossone and Troyka provided teachers of 2066 remedial high school and college English students with thirteen Teacher Activity Packages to be used over one semester. The reading treatment included such traditional tasks as identifying topic sentences and supporting details, identifying subjects and predicates in various types of

sentences, and following the development of an expository essay by recognizing the major and minor ideas and their relationships. On the final writing measure, the experimental groups were significantly better than the control groups when compositions were judged for ideas, organization, sentence structure (gross errors), wording, and punctuation. Interestingly, although the above measure appears to be heavily dependent on the mechanics of English usage, there were no significant differences between the two groups on a standardized test of editorial usage. Bossone and Troyka also reported that 80 percent of the experimental group but only 45 percent of the control group improved their expository writing by the end of the semester. The reading results, however, are ambiguous: on a curriculum-based reading test, significant differences favored the high-school but not the college experimental groups; on a standardized reading test, significant differences favored the college but not the high-school experimental groups.

Studies by Andreach (1975) Matt (1977), Hart (1980), and Austin (1983) illustrate the difficulties caused by using very restricted definitions of reading and writing skill. Matt, Austin, and Hart taught rhetorical techniques through discussion and analysis of literature as the reading treatment. Matt and Austin, however, defined reading gain as a test of awareness of rhetorical techniques "developed for the study" while Hart called writing improvement the

students' ability to use in their compositions the rhetorical techniques which were taught in class. Andreach (1975) used literary models to teach a grade-ten experimental group during one semester. Testing procedures, however, rendered his results uninterpretable. Although he reported that the experimental group showed gains greater than those of the control group at the .001 level of confidence, he qualified the results by noting that:

> The improvement of the experimental group was attributed to the fact that both the experimental treatment and the rating scale concentrated on the single expository component of organization (p. 112).

Because of the inappropriate measures, such studies make no contribution to our understanding of either reading or writing skill.

Recent studies by Taylor and Beach (1984), Crowhurst (in press), Braun and Gordon (1982), and Williams (1986), which examine the teaching of schemata and the structure of texts, appear to hold promise for explaining at least some of the factors contributing to the well-known correlational relationship between reading and writing. Taylor and Beach reported significant changes on both reading and writing measures as the result of teaching a hierarchical summary procedure to grade-seven social studies students for seven weeks. Each group prepared for the posttest in reading using

the strategies it had been taught: one experimental group read a passage which contained relatively familiar material, wrote a hierarchical summary of the passage, and studied the summary; a second experimental group used this procedure with a passage which contained relatively unfamiliar material; conventional groups read one passage or the other, answered questions on it, and studied the questions; control groups merely read and reread the passages. The test, which was written the following day, consisted of both a recall section in which students were asked to write all that they could remember about the passage and a set of thirteen short-answer questions. On the recall section of the passage containing unfamiliar content, the experimental students scored significantly higher ($p=.05$) than both the conventional and control groups, and on the passage containing familiar material, both the experimental and conventional groups scored significantly higher than the control group. On the short-answer test, the experimental and conventional groups scored significantly higher than the control group on both the familiar and unfamiliar passages.

The group which wrote hierarchical summaries, then, scored significantly better than the control group on all four tests of reading but significantly better than the conventional group (students who answered questions on study guides provided by the researchers) only on the recall test of the unfamiliar passage. On a writing sample judged for

overall quality, the experimental students scored significantly higher than the control students (p=.05), but not significantly higher than the conventional students whose scores were about midway between the scores of the other two groups. Considering only the two extremes of hierarchical structuring and no structuring, the relationships between reading and writing are unambiguous: the reading strategy influenced both the reading and writing of the experimental students in the relatively short period of seven weeks. Regretably, Taylor and Beach used a standardized reading test for a pretest (as an apparent check on the success of their randomization procedures), but not for a posttest. Had they also used a standardized test for a posttest, they would have been able to comment on the treatment's effect on a commonly used measure of reading ability rather than merely the success of their procedure on a test which could be expected to be amenable to that procedure. Of course, the timed procedures of most standardized reading tests would not admit to the detailed analysis of prose that the Taylor and Beach treatment uses.

Crowhurst (in press) demonstrated that teaching discourse schemata has a significant effect on the writing but not the reading of upper-elementary school students. To test the effects of instruction in the schemata of written persuasion on the reading and writing of grade-six students, Crowhurst designed three experimental treatments and one

control treatment: schemata instruction and writing practice, schemata instruction and reading practice, reading practice without instruction, and instruction and practice in group work. One reading test (a written response to a piece of persuasive discourse) and two writing tests were used at each test period. Following five weeks of instruction (two 45-minute lessons per week), both the schemata-plus-writing group and the schemata-plus-reading group wrote significantly better compositions ($p=.001$ and .01, respectively) than the control group. There were no significant differences, however, on the reading test, a finding Crowhurst suggested might be a factor of the difficulty of the reading passages.

Braun and Gordon (1982) instructed an experimental class of grade-five students in writing narratives for 15 hours over a five-week period. Significant differences ($p=.05$) favored the experimental group on the comprehension subtest of a standardized reading test (but not on literal or inferential comprehension) and nonsignificant differences favored the experimental group on holistically evaluated compositions. In addition, the experimental students did not make significantly more use of the text structures they were taught in either their written compositions or their responses to unfamiliar narratives. The authors suggest, however, that their efforts to minimize the Hawthorne effect by teaching the control group to write poetry during the experiment may have confounded the results. They noted

evidence that the control group was more stimulated by poetry writing than was the experimental group by narrative writing.

Williams (1986) instructed two groups of freshman basic writers in Jakobson's schema of communications and had them write a rhetorical analysis of eleven readings. Both experimental and control students wrote the series of personal essays customarily required for the course. Following the treatment, Williams found no significant differences between the two groups on either the writing measure (two expository writing samples) nor a standardized reading measure.

Over a period of fifty years, a number of researchers attempted to teach reading through various skills approaches and to measure any consequent effects on writing ability. Most failed to effect significant change on the primary variable, reading. Eruich (1931) taught vocabulary and paragraph reading skills to college freshmen in four experiments spread over two years. Of eleven measures of reading and writing ability used in the experiment, only two significant gains favored the experimental groups, both on vocabulary tests: when 25 of the 100 words on the test had been studied in class, the experimental groups showed significant gains; when all 25 words on the test had been studied in class, the gains were highly significant. However, Eurich noted that during the term the students did not study vocabulary they also lost their edge on these measures. The

control students, on the other hand, showed significant gains in reading rate and nonsignificant gains on two measures of writing ability: an essay and their final marks in English composition.

Schneider (1971) and Miller (1974) taught reading skills but neither effected significant changes on reading measures. Schneider used the SRA materials in a twelve-week experiment on the junior-college level and found no significant differences between groups on either a standardized reading measure or written compositions. Miller taught two sections of remedial composition reading skills while control groups studied descriptive and expository writing, rhetorical elements, and usage problems. He reported no significant differences on a standardized reading posttest or on the College Placement Test but found that the control groups were significantly better on both a vocaboulary measure ($p=.05$) and a measure of writing quality ($p=.01$).

In a study at the grade-nine and -ten levels, Belanger (1978) used a reading treatment designed to help students to rely on their knowledge of the sound system of English to decode the printed page. The experimental students showed significant ($p=.001$) and substantial (roughly one-half year's difference on the test norms) growth over the control groups on standardized reading tests written three months and six months following the treatment. However, there were no consequent gains on writing samples evaluated for overll

quality, T-unit length, Syntactic Density Score (revised), or length of compositions. Belanger suggested that a lack of student motivation to write and inadequate writing instruction in the classes may have prevented students from producing compositions which were representative of their writing ability. He noted that by and large neither the experimental nor the control writing samples showed much commitment to the task.

Although there has been a good deal of theoretical discussion and advice over the years on the benefits of wide reading or the imitation of models on learning to write (e.g., Corbett's *Classical Rhetoric for the Modern Student* or Rollo Brown's *How the French Boy Learns to Write*), there have been surprisingly few empirical studies to test the imitation/model assumption, attributable at least partially to the difficulty of measuring the long-term effects hypothesized for the methods. Consequently, most data tend to be correlational or biographical or unexpected discoveries of researchers pursuing tangential studies. For example, the most comprehensive empirical data on the influence of wide reading on writing ability at the high-school level was provided by Heys' (1962) testing of Conant's theme-a-week assumption. To test Conant's suggestion that to improve the writing of high-school graduates, each student should write one composition each week, Heys randomly assigned all students in grades nine through twelve in one high school to

either the theme-a-week treatment or control group. To avoid confounding the data by offering the control group instruction which might improve their writing, Heys simply gave the control students two free reading periods per week. At the end of one academic year, the control group made gains double those of the writing group on both the STEP Writing test and compositions judged by College Entrance Examination Board raters. Unfortunately, Heys did not use any reading measures and did not report the statistical significance of the differences on the writing measures. DeVries (1970) reported similar trends in a nine-week study of grade-five students but differences on both the reading or the writing measures failed to reach the statistical significance ($p=.05$). However, 15 hours of free reading could hardly be expected to make much difference. Christiansen (1965) found no significant differences in writing ability between college freshmen who wrote extra themes during a semester and those who were given additional reading assignments. He concluded that the writing practice and reading practice were equally effective.

In a three-year study in New Zealand, Elley, Barham, Lamb, and Wyllie (1976) reported no significant differences among groups studying transformational grammar or traditional grammar or students allowed free reading for forty percent of their English class periods. Slight, statistically nonsignificant differences on written compositions favored

the reading group at the end of the first year and the transformational grammar group at the end of the third year.

Evidence to the contrary is offered by Kelley (1984) who reported that grade-six students who studied either sentence and paragraph structure or a flexible, creative approach to story writing over a ten-week period (fifteen hours of instruction) wrote significantly better stories ($p=.01$) and scored significantly higher on a standardized reading test ($p=.01$) than control groups who had been allowed the time for sustained silent reading.

The influence of literature study on writing skill is also unclear. Descriptive studies by Eckhoff (1983, 1985), Burton (1985), McConnell (1983), Mills (1974), and Glazer (1973) have shown that subjects' reading and literature study have a significant impact on both the content and structure of their writing. On the other hand, intervention studies by Nielsen (1980), Louque (1984), and Michener (1985) did not report significant changes on writing measures as the result of various short-term literature or reading treatments.

In a careful study of the influence of two basal reading programs on the writing abilities of students in grades two to four, Eckhoff (1985) reported that children who studied a linguistically more complex basal series used linguistically more complex sentence structures in their writing than students who learned to read using the less complex basal

readers. She noted that style and format features in the basal readers served as models for the children's writing as well. Eckhoff found that the controlled vocabulary and lack of linguistic complexity in the early readers of one basal series seemed to have a lingering effect even after the later, more complex readers in the series had been studied in grade four.

Mills (1974), McConnell (1983), Burton (1985), and Glazer (1973) demonstrated that primary and intermediate students' literary experiences influenced their writing. Mills reported that students who had read and discussed literature prior to writing over a four-year period wrote significantly better compositions at the end of grade four than students who had not received integrated literature-composition instruction. Mills used both a holistic composition scale and the capitalization, punctuation, and total language sections of a standardized usage test to evaluate the students' writing ability. Glazer reported that oral literature study helped grade-four and grade-six students to create significantly better stories than those written by students who had no planned literature study.

McConnell divided second-grade children into four groups based on their exposure to literature and their writing practice. She reported that the group of students who had high literature exposure and frequent writing practice

received significantly higher holistic ratings on narravite writing samples than did students in the other three groups, but that there were no significant differences on measures of vocabulary or story structure among the four groups. Case studies of two of the children led McConnell to conclude that "sex, intellectual ability, reading ability, television viewing hours, and motivation need to be considered in future studies examining factors which influence writing ability."

Burton (1985) used an observer-as-participant method during an entire school year to study the way that third- and fourth-grade students used literature in their writings. He concluded that "borrowing and improvising was a thinking strategy that child writers used to create text" and that the children used literature as a source of authentic experience.

On the other hand, short-term treatments using models or oral literature or comparing methods of presenting literature have made no significant difference to students' writing. Michener (1985) found that daily fifteen-minute oral readings over a twelve-week period made no significant difference to the semantic maturity, syntactic maturity, or writing style of 47 randomly selected grade-three experimental students. Nor did she note any effects in a delayed posttest administered four weeks following the experiment. Nielsen (1980) reported no significant differences in the compositions of grade-four students who read silently and those who were read to by their teacher or those who were

asked prereading questions and those who were not. Louque (1984) found no significant differences in the overall writing quality of grade-seven students undergoing one of three treatments: newspaper reading, newspaper reading preceded by free writing, or newspaper reading combined with guided writing.

b. *The Effect of Writing Instruction on Reading Ability.* Studies of the influence of writing instruction on reading skill have generally used one of three treatments: direct writing instruction, simple writing practice, or summarizing and notetaking. Direct writing instruction has taken the form of sentence and paragraph studies (Reed, 1967; Weaver, 1977; Kelley, 1984); organization (Salisbury, 1934); logical connectives (Obenchain, 1971); a computer writing program (Thompson, 1985); and the writing process (Ferris and Snyder, 1986). Only the treatments which emphasized sentence and paragraph analysis have had significant effects on reading ability. Simple writing practice has had mixed effects on students' reading ability depending on the type and length of the treatment. While summarizing and notetaking have resulted in significant improvement on reading comprehension measures, the findings seem to attest more to the value of writing as a general mnemonic than as an aid to reading skill *per se*.

The study of syntax and paragraph structure and the organization of expository writing have produced consistently significant results on reading measures. Kelley (1984) used

one of two experimental treatments (either a traditional sentence/paragraph structure approach or a flexible, creative approach for teaching story writing) with grade-six students while control students were given time for sustained silent reading. Following ten weeks of instruction (twenty-three 40-minute lessons) both groups of experimental students wrote significantly better stories ($p=.01$) and scored significantly higher on a standardized reading measure ($p=.01$) than the control students, but there were no significant differences between the two experimental treatments.

Reed (1967) taught syntax and paragraph structure to grade-seven students for a period of fifteen weeks and reported that the experimental students showed significant gains ($p=.01$) on a reading comprehension measure. Weaver (1977) instructed third-grade students in sentence organization through anagrams. Following the treatment (fifteen minutes per day, three days per week for three months) the experimental students showed significantly greater gains ($p=.02$) on a cloze test than control students did. Salisbury (1934) taught thirty expository writing lessons to students in grades seven, nine, and twelve, and reported that experimental students experienced significant gains on both reading tests and school achievement tests.

A treatment which taught logical connectives to high school students, on the other hand, improved students' writte n compositions, but did not produce significant results on

reading measures. Obenchain (1971) reported that at the end of one academic year the experimental students wrote significantly (p=.001) better compositions than the control students did, but changes on a reading measure were nonsignificant: four groups who had studied the program throughout most of the year showed reading gains which approached significance (p=.06) but three groups which received the treatment during the first semester only showed only slight differences in reading skill at the end of the second semester. Such differences in the two experimental groups might have been the result of either the length of the treatment or retrogression following a four-month lapse of instruction.

Other writing programs, however, have produced mixed effects on students' reading abilities. Over a twelve-week period Thompson (1985) used a commercial write-to-read computer program to remediate 20 nine- and ten-year-old students who were reading at least one-half year below grade level. Following sixty hours of instruction over a twelve-week period, Thompson reported highly significant differences (p=.01) between experimental and control groups on the vocabulary and total reading scores of a standardized reading test but no significant differences on the comprehension scores. He did not report changes in students' writing abilities.

Ferris and Snyder (1986) taught twenty-five randomly selected grade-eleven students written composition using an approach which emphasized four stages of the writing process (prewriting, writing, revising, and presenting) and instruction in editorial usage. Twenty-five control subjects were selected from students receiving no instruction in English that semester. Following nineteen weeks of instruction, the experimental students made significant gains on a locally developed test of editorial usage and nonsignificant gains on a vocabualry measure. On a standardized reading comprehension test, however, the experimental students experienced a "slight, nonsignificant decrease."

Creative writing treatments (De La Rosa, 1979; Oehlkers, 1971) and expressive writing treatments (Arthur, 1980) have generally failed to demonstrate effects on reading skill, but integrated reading-writing (Collins, 1980; Walker-Lewis, 1981) programs have produced mixed results. De La Rosa compared an experimental creative writing treatment (three 30-minute sessions per week for thirteen weeks) with a control treatment of sustained silent reading which also included nine creative writing sessions. She reported significant differences ($p=.05$) favoring the experimental groups on one standardized reading test but no significant differences on a second standardized reading test. Arthur compared directed (stimulus supplied by the teacher) and

non-directed (students given free choice of topic with no prewriting stimulus) short (ten minute), daily expressive writing assignments on the grade-three level. Following six weeks of instruction, she reported no significant differences on either a cloze passage or a writing sample. Oehlkers used creative writing to teach 128 grade-one students to "encode oral language." Following the one-year experiment he found no significant differences on a standardized reading test between the creative writing groups and the control groups who were taught by a "language experience" approach. The lack of significant differences reported in both the Arthur and Oehlkers studies may be at least in part due to the similarity of the experimental and control treatments.

Walker-Lewis (1981) and Collins (1980) integrated reading and writing instruction for one semester with remedial college students. Walker-Lewis reported significant differences ($p=.05$) favoring the experimental group on both a standardized reading test and on linguistic variables in written compositions (number of T-units, number of co-ordinate connectives, and a word count) but no significant differences on a holistic evaluation of a written composition. Collins combined reading instruction and expressive writing assignments in an experimental treatment and taught reading alone to the control group. She reported significant gains ($p=.05$) for the experimental groups on the comprehension and total scores of a standardized reading test

but no significant differences on a vocabulary measure. Nagle (1972) using an experimental population of 371 grade-eight students, taught reading comprehension of social studies texts through writing activities. Following one semester of instruction, the experimental groups showed significant gains (p=.05) on a standardized reading test but not on a social studies achievement test.

There is also strong evidence to show that reading comprehension of study material is improved by such writing tasks as summarizing and notetaking, but studies in this area are based on a very restricted definition of writing and appear to address the broad area of mnemonics rather than be limited to reading *per se*. Stotsky (1984) discussed studies by Newlun (1930), Barton (1930), and Dynes (1932) which showed that students in grade five (Newlun) and high school (Barton and Dynes) learned and retained more from summarizing, outlining, and notetaking than students who simply read or reread material. She also cited a number of more recent studies which confirmed these findings (e.g., Taylor and Berkowitz, 1980; Glover, Plake, Roberts, Zimmer, and Palmere, 1981).

c. *Sentence Combining and the Improvement of Reading.* Summarizing work on sentence combining and the teaching of writing, Crowhurst (1983) noted that although almost all studies of sentence combining demonstrate significant increases in syntactic complexity, only half of these studies

report a concurrent significant improvement in writing quality. The same may be said for sentence combining and the improvement of reading. Studies by McAfee (1980) and Mackie (1982) have shown significant increases in reading ability as the result of sentence combining programs while studies by Straw and Schreiner (1982), Combs (1977), and Levine (1976) reported significant increases on some measures but not on others. On the other hand, Trivelli (1983), Mavrogenes and Padak (1982), Callaghan (1978), Menendez (1978), Sullivan (1978), Howie (1979), Phelps (1979), and Fisher (1973) did not find significant changes on reading measures following sentence-combining treatments.

In a six-week study at the grade-five level, McAfee (1980) found that sentence-combining instruction which included the study of organization and writing of paragraphs and stories had a significant effect ($p=.05$) on both the reading ability as measured by a standardized test and the composition quality of 25 experimental students. However, it is not clear whether the sentence combining exercises or the study of prose structure when combined with the writing activities is responsible for the differences McAfee observed. Mackie (1982) taught sentence combining to three experimental classes of grade-four students for twenty weeks while two control classes studied the normal composition curriculum. Following the sixty half-hour lessons the experimental group performed significantly better ($p=.05$) on

both a standardized reading test and a written composition than control students did.

Straw and Schreiner (1982), Levine (1976), and Combs (1977) reported that sentence-combining programs influenced one reading measure significantly but not another. In a study of grade-four students, Straw and Schreiner reported that 25 half-hour lessons in sentence combining had a significant effect ($p=.01$) on a listening test, a cloze reading test, and the number of words per T-unit in written compositions, but not on a standardized reading test. Levine, on the other hand, using 96 sentence combining lessons on the grade-six level, found significant effects on a standardized reading test but not on a cloze test. On the grade-seven level, Combs found significant differences in reading comprehension but not reading rate.

A number of careful studies have failed to report significant reading gains as the result of sentence-combining programs. For example, in a year-long controlled experiment involving 580 ninth-grade students, Callaghan (1977) used three different sentence combining-treatments: a regular sentence combining-program, a program which included oral exercises, and a program which contained twice as many written exercises as the regular program. Pre- and posttests consisted of two standardized reading tests and four writing samples at each sitting. Despite significant differences in T-unit length and the number of final free modifiers for each

of the three treatment groups when compared to the control group, Callaghan reported no significant differences on the writing qualaity measure or either of the reading measures. He also noted some erosion of syntactic-complexity scores in follow-up papers written three months following the end of instruction. Howie (1979) reported similar findings in a 15-week study at the grade-nine level which included a one-week component designed to teach transfer of sentence-combining skills to reading and writing. Posttests revealed that the syntactic complexity of descriptions but not expositions written by experimental students was significantly (p=.001) different from that of the control students, but she reported no significant differences on a cloze test. Fisher (1973) found that experimental students in grades five, seven, and nine who were taught sentence combining wrote compositions of significantly (p.=001) higher quality than those of control students but reported no significant differences in reading on either a standardized or a cloze test.

On the grade-eight level, Phelps (1979) found no significant differences among three instructional treatments (sentence-combining exercises integrated with reading study guides, reading study guides alone, or lists of questions about literature) as measured by either a cloze test or a test of content achievement. Sullivan (1978) found that neither the number of lessons (fifteen or thirty) nor the

method of presentation (including choral recitation in fifteen lessons) was significant in improving either the reading ability as measured by a standardized test nor the writing ability of grade-eleven students. Using instruction in traditional grammar as a control, Trivelli (1983) found that thirty hours of instruction in sentence combining on the grade-eight level did not result in significant changes on either a standardized reading test or the syntactic complexity of the students' written compositions. In a 24-week experiment with fifty-five grade-nine disabled readers, Mavrogenes and Padak (1982) tested three experimental treatments: daily exercises in syntactic manipulation combined with reading while listening; reading while listening only, and syntactic manipulation only. They reported no significant differences between the experimental and control treatments on either a standardized reading test or a cloze test.

Both ability of the subjects and the grade level of the study may be related to the findings. Hughes (1975) found that the ability level of the students influenced the results. She reported that only the low- and mid-ability readers showed significant gains ($p=.05$) in reading comprehension as the result of instruction in sentence combining. The majority of the studies above which reported at least some significant differences were carried out in elementary schools while most of the studies which failed to

find significant differences took place in junior secondary schools. However, the differences in results do not appear to be attributable to either the lengths of the studies or the measures used. The studies reporting nonsignificant differences were up to one year in length; both standardized tests and cloze tests were used in both the successful and unsuccessful treatments.

d. *The Reading and Writing Processes*. Recently attention has shifted from the products produced by reading and writing to the reading and writing processes. These studies include ethnographic research observing students as they use the two processes (Ryan, 1983; Dahl, 1984; Kirby, 1986), the role of reading in revision (Scott, 1985; Kettlewell, 1985) and during the writing process (Atwell, 1981), and variations in the process used by readers and writers of different ages (Birnbaum, 1981; Shepherd, 1986) or by those undertaking different rhetorical tasks (Lowe, 1985).

Ryan (1983), Dahl (1984), and Kirby (1986) used case studies and interviews to examine the reading and writing processes of students engaged in a variety of reading and writing activities. Ryan conducted problem-solving interviews to identify six reading/writing strategies used by a sample of eight good grade-five readers when reading and writing narratives and expositions. She found that all six strategies (reporting, conjecturing, contextualizing, structuring, monitoring, and repairing) were used in both reading and

writing but that only three of the eight students used strategies flexibly in both their reading and their writing. The other five used only limited strategies beyond simple reporting in reading and/or writing. Ryan concluded that strategies used in one process were not always used proportionately in the other. Kirby found that high-risk college students used a limited number of strategies which did not vary with the task for either reading or writing. She reported that these students were better able to monitor the meaning they constructed in both reading and writing when they wrote about their reading and when when read their own pieces of writing aloud. Dahl used case studies and introspective accounts to examine the processes of college students engaged in a one-semester course which juxtaposed reading and writing. She concluded that writing performance was shaped by reading experiences and that it varied from one task to another. She noted that student summaries written after reading attempted to sound like the original text and that if the subject matter of a reading passage was familiar to the students they used the author's text structure in their summaries.

Kettlewell (1985) and Scott (1985) reported differences in the role played by reading in the revision processes of good and poor readers while Atwell (1981) found that the character of the writing process varied according to the visibility of the text and the ability of the writer.

Kettlewell examined the role of reading in the revision processes of fifteen skilled and fifteen unskilled college writers during two drafts of an essay. She found that twenty-nine of the thirty subjects read their work both within and between drafts but that the skilled writers both read and wrote twice as much as the unskilled writers, a proportion that was consistent for both first and second drafts. She noted that both groups read for all five purposes (to verify, clarify, provide direction, edit, and refresh memory) but that the skilled writers made significantly more changes as a result of their reading than the unskilled writers did. Scott observed sixty good and poor grade-five readers as they wrote and revised a set of directions for constructing a geometric design and as they carried out a simulated revision task. She reported that good readers detected more problems than poor readers did and that detections of problems made during reading were highly associated with the quality of the final draft. However, she noted that the detection of an error was no guarantee that it would be corrected. Atwell compared the processes and written products of ten above-average and ten basic freshmen writers under two conditions: with or without the opportunity to reread the text as they wrote a narrative essay. She reported no significant differences in the coherence of the text as the result of the blind or visible treatment but noted that both the good and basic writers doubled the number of unacceptable syntactic structures under the blind condition.

Exmaining the process used by the two groups she found that the visible writing was far more recursive than blind writing for the good writers and that writers who had clear superstructural plans for their writing were least affected by the blind condition. She also noted that the basic writers were markedly less fluent in the blind condition than when they could read their texts.

Birnbaum (1981) and Shepherd (1986) compared the reading and writing processes of students at two grade levels. In case studies of four fourth- and four seventh-grade, students Birnbaum reported several differences in the processes used by more and less proficient readers and writers (although all subjects were considered good readers and writers by both their teachers and themselves). Birnbaum noted that age-related differences were apparent but that at both grade levels, the more proficient readers and writers were more reflective, deliberated over a wider range of criteria (whether selecting readings or planing compositions), anticipated audience response, and were more concerned with stylistic and rhetorical choices than the less proficient readers and writers were. The primary concern of the less proficient students seemed to be accuracy in decoding and encoding. Shepherd collected think-aloud protocols from four students and four adults and concluded that the adults exhibited more common correlations between their reading and writing processes than the students did.

Lowe (1985) examined the reading and writing processes of four college freshmen as they read and wrote essays representing four different rhetorical tasks: analysis, comparison, classification, and cause and effect. She found that the subjects' reading and writing processes were consistent across the four tasks and that their composing processes were similar to their reading processes: for example, prior to reading they did not preview the essays they were to read; prewriting was brief, mental, and concerned with local planning rather than global planning. Proficiency, however, varied across tasks with the analysis essays causing the most reading difficulty, producing the lowest summary scores, and producing the poorest examples of the students' essay writing.

IV. Summary

Despite a small amount of evidence to the contrary, moderate correlations between reading and writing skill may be considered very well established by studies using a broad range of subjects, measures, and treatments. Hammill and McNutt's (1980) meta-analysis of reading and writing measures in thirty-seven studies found a median correlation of .61. The grade level examined does not appear to be a significant influence on these correlations but the sex of the subject does (reading measures correlate more highly with writing quality scores for girls than for boys, but more highly with

syntactic complexity measures for boys than for girls) as does the type of measure used (cloze tests correlate poorly or negatively with writing measures; syntactic complexity correlates with some reading measures but not with others). Spelling and usage in written composition correlate moderately with standardized reading tests. Environmental factors such as the number of books in the home, the amount reading done by the father, and reading aloud to children after they have learned to read for themselves also correlate significantly with reading and writing skill.

A different perspective is gained by examining the percentage of good readers and good writers who perform poorly on the other skill. Loban's (1966) observation that about twenty percent of the good readers and writers scored considerably lower on the other skill has been supported by a number of other studies.

Empirical and descriptive studies of the reading-writing connection have investigated one of four models: the influence of reading treatments on writing, the influence of writing treatments on reading, the influence of language competence on both, and the relationships between the two processes. On the whole, these product experiments have been unsuccessful, often because researchers have been unable to effect a significant change in the primary variable (e.g., reading ability) which undermines the expectation of change on the secondary variable (e.g., writing skill). In addition,

inasmuch as reading and writing are far from perfectly correlated, substantial change on the primary variable rather than merely statistically significant change may be required to effect measurable changes on the secondary variable. Furthermore, as Braddock et al. (1963) point out, learning to write proceeds with glacial slowness; treatments of one semester, a typical length of experiments, may be barely adequate to effect changes on the primary variable.

The summaries reported above suggest that writing treatments--especially those which teach prose structure or story schema and those conducted on the secondary or post-secondary levels--are more likely to influence reading achievement than are reading treatments likely to improve writing. On the other hand, in an analysis of three models of reading-writing relationships using data from twenty-one classes of grade-two and -five students, Shanahan and Lomax (1986) concluded that the interactive model "in which reading knowledge could be used in writing and writing knowledge could be used in reading" provided the best description of their data (p. 122). They also found that the reading-to-writing model was superior to the writing-to-reading model but suggested that this might be the result of instruction and practice in reading being far greater than in writing at these two grade levels.

Reading-upon-writing treatments have been the most numerous but the least successful. Treatments have included

analysis of rhetorical devices and sytlistic matters, study of schemata and text structures, vocabulary and paragraph reading instruction, commercial reading skills programs, and phonics-based treatments. Although many researchers reported changes on one measure or the other, no study demonstrated significant changes on both standardized reading measures and reliably evaluated compostions as the result of a reading treatment. While there is some descriptive evidence that wide reading and imitation influence writing ability, studies using these as treatments have generally not produced significant changes on writing measures. There is also evidence that the basal reader series used to teach beginning reading and the literature program studied by students influence student writing, even after the linguistically less complex basals have been replaced by more complex texts.

Creative and expressive writing treatments have generally not produced significant results on reading measures, but treatments integrating reading and writing instruction have shown significant effects on most reading measures. Writing treatments which have taught sentence and paragraph structure have shown significant improvement on both reading and writing measures, and a year-long study of logical connectives significantly improved writing ($p=.001$) but not reading ($p=.06$). Creative Experiments have also shown that such study skills as summarizing and notetaking help students to learn and to retain reading material.

Two major difficulties which confront researchers studying the influence of reading treatments on writing ability are the amount of time required to effect change on the secondary variable and the problem of constructing a pure test of either reading or writing. The duration of the majority of reading-writing studies--one semester or less--may be inadequate for transfer of skill from a primary to a secondary target. However, the fact that many studies have not found results in the hypothesized direction (they have not merely failed to reach statistical significance) suggests that increasing the length of the treatment may not alter the outcomes. The problem of the confounding variables in measurement will be difficult to overcome because writing tests are highly dependent on reading (the more objective the test, the more dependent it is on reading; see, for example, the STEP Writing test) and all but multiple-choice reading tests depend on writing. These difficulties not withstanding, the results of many reading-writing studies are not interpretable because of the idiosyncratic tests of reading or writing used (e.g., Austin, 1983; Hart, 1980; Matt, 1977) or the lack of reliable methods to grade written responses (e.g., Mathews, Butler, and Larsen, 1945; Hart, 1980; Williams, 1986). Some studies simply tested discrete skills which were taught (e.g., a test of recognition of rhetorical devices or a tally of the structures or devices taught by the treatment which appeared in students' compositions) and called that reading or writing. An additional difficulty is

encountered in many studies because of the lack of a clear definition of reading. It is not always obvious whether the author feels that reading is a psycholinguistic guessing game, a collection of skills, or an automatic decoding of phonemes. Indeed, many researchers appear not to have troubled themselves with such distinctions.

Two-thirds of the studies using sentence-combining treatments to improve reading found no significant differences while one-third reported either significant or mixed results. However, only two of the fourteen studies cited--both at the elementary level--reported unambiguous results on all reading measures used. Findings of the sentence-combining treatments appeared to be related to both the grade level (most of the successful studies were conducted on the elementary level) and the ability of the subjects.

Studies of the commonalities between reading and writing processes have been wide ranging and diffuse and have examined such aspects as the strategies students use when reading and writing, the role reading plays in revision, and the different processes used by good and poor readers, by students at different grade levels, and by students undertaking different rhetorical tasks. As earlier research on the writing process would suggest, good readers and writers are more flexible in the strategies they use than poor readers and writers are, and skilled and unskilled

writers use different processes in revision. The grade level of the subjects appears to make a small difference in the strategies used, but while some rhetorical tasks are more difficult than others, the subjects' reading and writing strategies are consistent across the tasks. At this stage, process research has not examined the common strategies readers and writers use to construct meaning in their transactions with printed texts.

V. Conclusions and Implications

A major criticism of previous research into reading-writing relationships is that it has been atheoretical (Mosenthal, 1983). Studies have examined how isolated methods or treatments impact upon products rather than attempted to test theoretical models of the ways in which one process is related to the other. By analogy, researchers have worked as technicians, haphazardly tinkering with engines in an effort to make them run more efficiently rather than as engineers seeking to discover the physical laws and principles of motor mechanics. Shanahan and Lomax (1986) add that research has generally examined single components of reading and writing and failed to treat the two as a "constellation of interrealted processes that use a number of knowledge bases" (p. 116). They elaborate:

> [Research] has not indicated how and when various components of reading and writing come into play,

> or how various changes in component processes of reading or writing are mediated or incorporated in other component processes. Thus previous research has identified relationships between rather general conceptions of reading and writing, but has failed to provide adequate discription or explanation of more specific aspects of the relationship. (p. 116)

As the above summaries demonstrate, we do not have much useful hard data on the relationships between reading and writing largely because we have tinkered with methods rather than tested theoretical constructs. Since comparisions of teaching methods or materials do not advance our understanding of the human mental processes underlying reading and writing, much time and effort have been wasted in pitting method a against method b. Indeed, even many of the studies which have produced statistically significant results turn out to be mere interesting curios due to a lack of a conceptual framework. Of what value is it, for example, to know that primary students who study creative writing improve their reading more than students who do not? On what basis is creative writing instruction thought to be linked to reading ability? Clearly the opportunities for such studies are endless (the impact of debating, drama, studying social studies or Bible reading, for example) and may be multiplied many times by examining different ability levels, age ranges, and personality factors; however, the conclusions will remain

of little interest because they do not contribute to our understanding of the principles by which reading and writing are learned.

The ambiguousness of many research findings--studies which report significant differences on one standardized reading test but not on another, for example--is also rooted in a lack of theoretical underpinnings. In order to measure changes accurately, it is necessary to be able to predict on the basis of some hypothesized model of human behavior that force x will result in reaction y. Without such a model, researchers are unlikely to be able to describe the exact nature of the changes brought about by a particular treatment, precisely how one skill relates to the other.

The diffuse nature of much of the research and the lack of cumulativeness (the circular nature of studies which address essentially the same questions time after time) can also be traced to an absence of a firm theoretical grounding. Since researchers have not addressed questions which test aspects of a theoretical model, there is little solid cumulative knowledge on which to structure a subsequent set of questions. It is clear that the previous atheoretical research into the relationships between reading and writing has not advanced our understanding of connections between the two and that future atheoretical research is likely to achieve similar results.

Some of the more promising research noted above (e.g., the testing of schema theory or the influence of sentence-combining treatments on reading) is firmly grounded in theoretical models and likely to provide insights into the underlying cognitive processes which characterize the reading-writing relationship. Researchers face a difficult problem in that the more interesting theoretical constructs (e.g., exploring reading-writing connections through Rosenblatt's transactional theories of literature) do not appear to lend themselves well to empirical research.

As is obvious in the above discussion, in my opinion research into connections between reading and writing will not advance until we construct theoretical models of the processes and devise experiments which test components of these models. Such research must be theory-based, focused, and cumulative if we are to avoid another series of reinventions of the wheel. The work reviewed in this paper also leads to several additional suggestions for future researchers.

1. *Measurement*. The results of a number of reading-writing studies have been uninterpretable because of the measures used. In many cases the evaluation instruments define reading and writing so narrowly (e.g., the ability to recognize rhetorical techniques in a reading passage or to use a particular pattern of organization in writing) that the studies cannot be said to measure either reading or writing

skill. On the other hand, as Shanahan and Lomax (1986) suggest, global measures may be inadequate to assess the small number of individual components of the constellation of reading and writing skills which may be addressed by a given study. In future research, then, the difficulty will be in striking a balance between focused and global measures while limiting evaluation to a manageable number of tests.

2. *The Language of Students' Texts.* Eckhoff (1985) has demonstrated convincingly that the language of basals studied by beginning readers influences not only the format of their writing but also the structure of their written langauge and that this influence persists long after the linguistically impoverished beginning texts have been replaced by more mature readings. Since at intermediate levels and beyond students are exposed to a good deal of print both in and out of school, the influence of a particular reading or English text is unlikely to have the same powerful effect that Eckhoff observed. However, studies which focus on specific characteristics to be induced from texts might well offer insights into how rhetorical knowledge is acquired from reading (e.g., Bereiter and Scardamalia's (1983) finding that subjects given a reading in an unfamiliar genre and then asked to write a piece in the same genre were most successful in imitating concrete, word-level features and least successful with abstract, structural characteristics; or Church and Bereiter's (1984) observation that being

instructed to observe how a passage was written had no significant effect on subjects' attention to style).

3. *Mismatches*. Studying the exceptions to the normal patterns may offer insights into reading-writing relationships. For example, what facilities or deficits lie behind the finding that about twenty percent of the good readers are poor writers and vice versa? What processes or strategies do these subjects use in one that they do not use in the other? Research might also examine the sex-related differences in correlations. Why do reading measures correlate more highly with quality measures for girls but syntactic complexity measures for boys? Previous studies have shown that some tests correlate highly with specific features of writing while others do not. Why do cloze tests often correlate poorly or negatively with measures of syntactic complexity while standardized tests of reading correlate positively? The reading-writing relationship appears to have different characteristics at different grade levels. Studies following Shanahan (1984) and Barnes (1984) might contribute to our understanding of the developmental nature of the reading-writing relationship. The above summaries show that writing treatments have had significant effects on reading measures, but reading treatments have not significantly influenced writing skill. Shanahan and Lomax (1986), however, reported that on the grade two and five levels the read-to-write model fit their data better than the

write-to-read model.

4. *Meta-analyses*. Summaries such as that above draw together and classify research and theory (and speculation and hunches) on reading-writing relationships and attempt to arrive at general conclusions and implications. The failing of such summaries, however, is that they do not have any way of quantifying the combined weight of a range of studies. They categorize findings as being significant or nonsignificant and try to summarize similarities and differences in treatments, methods, and measures, but they are limited to very primative estimates of the pooled significance of a number of studies on the same topic. Even Hammill and McNutt's (1980) summary of correlational data--one of the few attempts to analyze data beyond the single study--was limited to reporting the median correlations of the research examined. A detailed meta-analysis such as Hillocks' (1986) *Research on Written Composition* which focuses only on studies of reading and writing could place the various schools of thought into statistical perspective.

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